REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended claim 1 to further define the compound (B), i.e., to recite that the compound (B) is represented by the general formula (10):

$$X\text{-}(NR_4R_5)_n \quad \ldots (10)$$

wherein X represents an n-valent organic group, n represents an integer of 2 to 6, each of R_4 and R_5 represents hydrogen or a monovalent organic group, and at least one of this monovalent organic group is selected from the group consisting of formulas (7)-(9) previously set forth in claim 1. See pages 19-26 of Applicants' Substitute Specification, submitted with the Preliminary Amendment filed September 27, 2006 (hereinafter "Applicants' Substitute Specification"). Applicants have further amended claim 1 to recite that the polymer (A) is a polyimide precursor, a polyimide, a polybenzoxazole precursor, a polybenzoxazole, a copolymer thereof, or a mixture thereof. Note, for example, page 3 of Applicants' Substitute Specification. Applicants have cancelled claims 3 and 4 without prejudice or disclaimer.

In addition, Applicants are adding new claims 17 and 18 to the application. Claim 17, dependent on claim 1, recites that the polymer (A) has the acid functional group. Claim 18, dependent on claim 1, further defines R_3, consistent with the description on pages 19-26 of Applicants' Substitute Specification.

The concurrently filed RCE Transmittal is noted. The present amendments constitute the necessary Submission under 37 CFR 1.114 for this RCE Transmittal; and in view of the filing of this RCE Transmittal, entry of the present amendments is

clearly proper, notwithstanding the Finality of the Office Action dated October 23, 2009.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the reference applied by the Examiner in rejecting claims in the Office Action mailed dated October 23, 2009, that is, the teachings of U.S. Patent No. 6,929,891 to Rushkin, et al., under the provisions of 35 USC 102 and 35 USC 103.

It is respectfully submitted that this reference as applied by the Examiner would have neither taught nor would have suggested such a photosensitive resin composition, or method for forming a pattern using such composition, or an electronic part having an electronic device with a pattern obtained by such method, as in the present claims, including wherein such composition includes, in additional to, inter alia, a photoreactive compound and a polymer having an acid functional group and/or a substituent derived therefrom (more particularly, an acid functional group as in claim 17), the compound (B) as in present claim 1, i.e., a compound represented by the general formula (10):

$$X\text{-}(NR_4R_5)_n \qquad \ldots (10)$$

wherein X represents an n-valent organic group, n represents an integer of 2 to 6, and each of R_4 and R_5 represents hydrogen or a monovalent organic group, with at least one of the monovalent organic groups being selected from the group consisting of the formulas (7)-(9). See claim 1.

Moreover, it is respectfully submitted that the teachings of the applied reference would have neither taught nor would have suggested such photosensitive resin composition as in the present claims, having features as in claim 1, and,

additionally, wherein R_3 of the formulas (7)-(9) is selected from the group consisting of those set forth in claim 18.

In addition, it is respectfully submitted that the reference as applied by the Examiner would have neither taught nor would have suggested such photosensitive resin composition as in the present claims, having features as discussed previously in connection with claim 1, and, additionally, wherein R_3 in the general formulas (7)-(9) is a monovalent organic group having 1-20 carbon atoms (see claim 13); and/or wherein the compound of the component (B) serves as a chain extender capable of increasing molecular weight of the polymer of the component (A) during a heat treatment of the photosensitive resin composition (note claim 14); and/or amounts of the compound of the component (B), relative to amount of polymer of the component (A), in the photosensitive resin composition, as in claims 15 and 16; and/or substituents in components (A) and (B) as in claims 5 and 6.

Furthermore, it is respectfully submitted that the teachings of the applied reference would have neither disclosed nor would have suggested such photosensitive resin composition as in the present claims, having features as discussed previously in connection with claim 1, and, moreover, wherein the polymer of the component (A) is a heat-resistant polymer (see claim 7), particularly a specified polyimide precursor, polyimide, polybenzoxazole precursor or polybenzoxazole, or copolymer or mixture thereof as in claims 9 and 12; and/or wherein the acid functional group in the polymer of the component (A) is a carboxyl group and/or a phenolic hydroxyl group (see claim 8).

The present invention relates to a photosensitive resin composition, method of use thereof and products formed therewith, such photosensitive resin composition being useful, for example (and not to be limiting), as a heat-resistant photosensitive

material in a surface protecting film or interlayer dielectric film for a semiconductor device.

In the semiconductor industry, in recent years, organic materials having heat resistance, such as polyimide resins, have been used in, e.g., interlayer dielectric films. As described in the last full paragraph on page 2 of Applicants' Substitute Specification, improvement of development properties of photosensitive resins is important, and therefore the resin is comprised of a polymer having a low molecular weight for increasing solubility. However, polymers having a low molecular weight exhibit unsatisfactory mechanical properties after curing, and thus conventional photosensitive resin materials have a problem in that they cannot exhibit advantageous resin properties.

Against this background, and as a result of intensive studies by the present inventors, it has been found that by using a heat-resistant polymer or a precursor thereof having an acid functional group or a substituent derived therefrom, together with a compound having specific functional groups, the resin component can be cured to have an increase in molecular weight, so that a cured resin having desired properties can be formed, without sacrificing development properties. Note the first full paragraph on page 3 of Applicants' Substitute Specification.

Specifically, through use of the compound of the component (B) as in the present claims, together with the recited polymer, a photosensitive resin composition is achieved which has good development properties, yet which exhibits good properties as a layer after curing.

That is, according to the present invention, the polymer (A) has an acid functional group or its derivative, and compound (B) has an amine functional group; and the reaction therebetween achieves chain extending, during post exposure

baking, resulting in a molecular weight increase of the polymer, as a result of which the composition before baking has properties such as photosensitivity and resolution, whereas the cured composition (that is, after baking) has excellent properties for a cured layer such as elongation properties.

Rushkin, et al. discloses a negative photosensitive resin composition which is a chemically amplified, aqueous-based developable photosensitive polybenzoxazole precursor composition, suitable for application in the field of microelectronics. The photosensitive composition described in this patent includes one or more polybenzoxazole precursor polymers; one or more photo-active compounds which release acid upon irradiation; a latent crosslinker which contains at least two N-$(CH_2OR)_n$ units, wherein n is 1 or 2 and R is a linear branched C_1-C_8 alkyl group (with proviso); and at least one solvent that is not N-methyl-2-pyrrolidone. See column 2, lines 18-54. Note also column 2, line 55, to column 3, line 26, for a method of using this composition.

Note that Rushkin, et al. discloses a latent crosslinker which contains at least two N-$(CH_2OR)_n$ units. It is respectfully submitted that the teachings of this patent do not disclose, nor would have suggested, such composition as in the present claims, including wherein the compound having at least one substituent derived from an amine functional group includes such at least one substituent selected from the group consisting of the general formulae (7)-(9) as in the present claims. Specifically, it is respectfully submitted that the latent crosslinker containing the at least two units as in Rushkin, et al., does not disclose, nor would have suggested, the compound having the least one substituent as in the present claims, and advantages achieved thereby.

Surely, the disclosure of Rushkin, et al. would have neither taught nor would have suggested the composition of the present claims, wherein R_3 is selected from the group set forth in claim 18.

It is emphasized that in Rushkin, et al., the crosslinker generates crosslinks during exposure. Note, in particular, the description in columns 13 and 14 in Rushkin, et al., disclosing that the latent crosslinker, when interacting with an acid formed after irradiation of the photo-active compound, forms a "carbocation", as described in the text material bridging columns 13 and 14 of Rushkin, et al. The "carbocation" formed from the crosslinker can then react with an OH group in a polymer chain or undergo a Friedel Crafts reaction with an aromatic ring, with reaction of two or more sites of the crosslinker with two or more polymer chains resulting in crosslinks, the crosslinks rendering the polymer less soluble in developer and creating a solubility differential with the unexposed areas necessary for image formation.

In contrast, the compound (B) according to the present invention serves, for example, as a chain extender capable of increasing the molecular weight of the polymer of the polymer (A) during heat curing, the polymer (A) being increased in molecular weight so that a cured resin having desired properties can be formed.

As can be seen from the foregoing, as well as from a full review of the teachings of Rushkin, et al. as compared to the present invention, it is respectfully submitted that Rushkin, et al. would have neither taught nor would have suggested the presently claimed subject matter, including the at least one substituent of the compound of the component (B), or functioning of the present invention.

The contention by the Examiner in the last paragraph on page 3 of the Office Action dated October 23, 2009, is noted. However, it is respectfully submitted that

the formulas in columns 23 and 24 of Rushkin, et al. are part of the polymer continuing from columns 21 and 22 of the patent. Alternatively, if the structural formulas in columns 23 and 24 of Rushkin correspond to compound (B), then Rushkin, et al. does not teach a polymer (A). In any event, Rushkin, et al. does not teach, nor would have suggested, the combination of polymer (A) and compound (B) of the photosensitive resin composition of the present claims, or use of such composition.

It is respectfully submitted that chain extension by reaction of separate polymer and compound components would not be achieved by the polymer in columns 21-24 of Rushkin, et al. It is respectfully submitted that the composition of Rushkin, et al. merely changes solubility upon light exposure by reaction of the latent crosslinker (c) with the polymer (a), as described in columns 13-15 of Rushkin, et al.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently pending in the above-identified application are respectfully requested.

Applicants request any shortage of fees due in connection with the filing of this paper be charged to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (case 1270.46593X00), and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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